STEM2Stern

Opening Minds • Capturing the Future

CAPTURING THE FUTURE

VOL. 1 ISSUE 1

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MESSAGE FROM THE NAVAL STEM EXECUTIVE

We are pleased to release our inaugural STEM newsletter -- Capturing the Future. Contained within this newsletter are stories of how our Naval STEM programs are having an impact, changing the lives of participants, and exposing them to possible Naval STEM career options. The Navy and Marine Corps have made it a priority to invest in our next generation of scientists and engineers through exciting, hands-on STEM (Science, Technology, Engineering and Mathematics) programs. We launched the Department's STEM2Stern Initiative in 2009 to create a "one-Navy" approach to STEM and to better leverage resources and maximize the impact of our STEM investments.

STEM skills and expertise are critical to the effectiveness of the Navy and Marine Corps -- without innovation we cannot maintain our military dominance. Unfortunately, by almost every measure, our country is falling behind in math and science. Across the Navy and Marine Corps we have decided that we must step up to help address this problem in order to ensure our future workforce. In March of 2010, Secretary Raymond Mabus issued a doubling goal for the Department's STEM investments. I am pleased to say that in FY 2011, the Department's STEM portfolio included education and outreach throughout all fifty states and reached over 85,000 students and 5,000 teachers -- strengthening our STEM talent pool and educating future Naval scientists and engineers.

As we enter into the next Phase of our efforts under the STEM2Stern initiative, we will continue to implement high impact STEM outreach and education programs and put into place robust evaluation tools to help guide our future investments.

We look forward to continuing our strong partnerships with national STEM leaders and organizations as we all work to inspire and engage our future scientists and engineers. Through a well coordinated and leveraged STEM program, the Navy will continue to make critical contributions aimed at strengthening America's competitive edge, and ensuring that a sufficient talent pool exists to support future Naval technological needs.

We hope you enjoy our first edition. We look forward to hearing your thoughts and thank you again for your inspiring efforts in STEM.

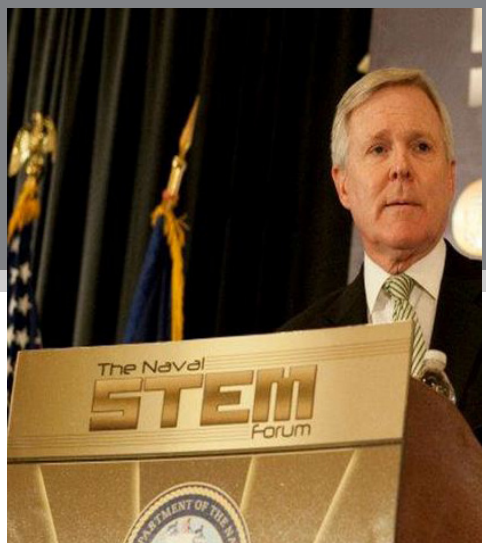
Sincerely,

Matthew L. Klunder
Rear Admiral, U.S. Navy
Chief of Naval Research
Naval STEM Executive

THE NAVAL STEM FORUM: LOOKING BACK OVER THE LAST YEAR

"We are in a very serious strategic STEM crisis. This is the most exciting era in human history for Science and Engineering. We have democracy, free enterprise, diversity, and a stunning history. It is time to be great again."

-- Dr. Charles Vest, President National Academy of Engineering



In June of 2011, a large and enthusiastic group of over 750 stakeholders from government, industry, academia and non-profit communities gathered at the first-ever Naval STEM Forum. Together they set out to accomplish three things: 1) share effective strategies and best practices in STEM education and educational technology research, 2) provide recommendations to help meet Naval STEM goals and 3) identify potential partnerships that would reach across the STEM education spectrum.

U.S. Secretary of the Navy, Ray Mabus, kicked off the Forum by renewing his doubling pledge, issuing the Naval STEM Roadmap, and stressing the strong linkage between STEM talent, U.S. competitiveness and national security. Other notables, such as Dean Kamen (FIRST), Dr. Charles Vest (National Academies) and Dr. Freeman Hrabowski III (University of Maryland, Baltimore County), also called for the continued investment, in and strengthening of, our STEM talent pool, beginning as early as Kindergarten and continuing on through higher education.

Over the last year, the Naval STEM Coordination Office has worked aggressively with many Forum participants and organizations --exploring new programming and collaboration opportunities. In addition, twelve small challenge grants were awarded as part of the Chief of Naval Research's Sponsoring Scholars Program and four research teams were selected as awardees of the Digital Tutor Grand Challenge. More information on both of these programs can be found on the ONR and STEM2Stern websites.

The Naval STEM program has also seen meaningful growth in the last eighteen months, both in numbers and the diversity of the audience touched by these programs. The newest programs have expanded the reach of Naval STEM programs to over 8000 new participants. These programs are are reaching students and teachers in urban, suburban, and rural communities, with strong participation from women and underrepresented minorities.

In the coming year, the Department will work to continue its implementation of the Secretary's Roadmap and define the next phase of STEM goals. Video and other STEM Forum materials can be found at: http://www.onr.navy.mil/Conference-Event-ONR/STEM-Forum.aspx.

SEAGLIDE SUMMER CAMP

Naval Surface Warfare Center (NSWC) Carderock Division engineer Michael Britt-Crane (right) explains how to assemble a SeaGlide to Alaskan grade school student, Jakob Bauer (left), during the SeaGlide Summer Camp Aug. 6-10, in Ketchikan, Alaska.

Seventeen middle school students from Ketchikan, Alaska and five teachers selected from across the state participated in the SeaGlide Summer Camp on August 6-10, 2012. This camp was hosted by the Naval Surface Warfare Center (NSWC) Carderock Division in partnership with the Juneau Economic Development Council (JEDC). Similar to the SeaPerch program, the SeaGlide program provides students the opportunity to build and test Autonomous Underwater Vehicles (AUVs) using a plastic water bottle and an Arduino electronics control system. SeaGlide is modeled from AUVs used by the Navy and private industry to obtain data in the ocean environment. In partnership with the Association for Unmanned Vehicle Systems International (AUVSI) and funded by the National Defense Education Program (NDEP), SeaGlide is on track to be available to teachers for use in their curriculum by the beginning of the 2013-2014 school year.

"SeaGlide, developed at NSWC Carderock, exposes students to more aspects within the STEM [Science, Technology, Engineering and Mathematics] disciplines," said NSWC Carderock Outreach Coordinator Toby Ratcliffe. "The difference between SeaGlide and SeaPerch is that SeaGlide is an autonomous vehicle, whereas SeaPerch is a tethered vehicle. SeaGlide introduces students to the technical aspects of programming and control, which extends their knowledge of these engineering principles beyond what they may learn with SeaPerch."

During the week-long event, the Alaskan students and teachers, guided by engineers from Carderock, built the SeaGlide AUVs and studied the principals of marine engineering, design, propulsion, buoyancy, programming, electrical circuits, force and motion. The students and teachers also had the opportunity to tour NSWC Carderock Division's Southeast Alaska Acoustic Measurement Facility (SEAFAC), the primary acoustic engineering measurement facility for the Navy.

SCIENCE NIGHT IN SPANISH

Celebrating Science, Technology, Engineering, and Math (STEM) was the theme of "Noche de la ciencia y la ingeniería en español," or "Night of science and engineering in Spanish." On August 23, 2012 at Southwest Middle School in San Diego, all of the evening's hands-on activities were in Spanish to provide an environment for Spanish-speaking families to learn and discuss STEM in a comfortable setting.

Enthusiastic scientists and engineers drew the 30 seventh and eighth grade students, along with their families, into activities that included acoustic and mechanical resonance, a robot, liquid nitrogen, and microbial fuel cells. Participants circulated through the demonstrations, interacting with the scientists, engineers, as well as student volunteers from local colleges. Capt. Bryan Lopez, executive officer at Space and Naval Warfare Systems Center Pacific (SSC Pacific) and Claudia Garcia, an engineer at Naval Air Systems Command (NAVAIR) shared with the students their personal stories about their careers in STEM with the Navy.

Meriah Arias-Thode, a scientist at Space and Naval Warfare Systems Center Pacific (SSC Pacific), demonstrates an activity highlighting microbial fuel cells and their uses to middle school students from Southwest High School, and a student from the University of California, San Diego.

Additional activities that evening included an interactive STEM demonstration led by SSC Pacific personnel, and an information session explaining STEM entrance requirements for college by a counselor at Southwest Middle School.

EXTREME TECHNOLOGY: ANNAPOLIS EDITION

This summer, high school students from around the country attended summer STEM programs hosted by the U.S. Naval Academy. This year's theme was "Extreme Technology: Annapolis Edition."

During these camps, faculty and staff led innovative, hands on modules in engineering, science, and technology. At the end of each week, students were given the opportunity to choose a module that they wanted to learn more about and then present their findings at a Technology Fair to other students, friends, family, and USNA faculty and staff.

New this year, was a STEM three-week program, tailored for older students and organized to simulate a professional conference. During the three-week session, students discussed engineering and scientific concepts and engaged in longer design challenges and competitions, allowing for more in-depth research and greater learning.

USNA Summer STEM camp attendee and staff member, LT Jeremy Biggs, identify biological species living in the Chesapeake Bay after experiments in water sampling in the estuary. Students then designed and built appropriate habitats for the species as part of the Aquaculture Engineering module.

CSI SUMMER CAMP

Engaged campers work in cooperative groups during the Paper Chromatography experiment to determine what pen was used to write a note found at the crime scene.

Campers participate in the DNA Extraction lab where they extracted DNA from strawberries.

On July 9-20, 2012 over 100 sixth and seventh grade students and 16 teachers attended Crime Scene Investigation (CSI) camps, hosted by Southern Methodist University's (SMU) Caruth Institute for Engineering Education, with support from the Office of Naval Research. These camps gave participants an introduction to the science and technology used by experts to solve crimes.

Through a variety of hands-on activities and presentations, campers got an in-depth look at the way forensic scientists and criminal investigators solve crimes using technology. Campers were first taught the about the technologies behind CSI and then used these learned skills to solve a mock murder. This experience provided real-life application for the science and math they learn in school.

The 16 teachers who participated in the camps came from Dallas, as well as KIPP schools in California, Colorado, North Carolina, Pennsylvania, and Texas. All teachers who participated in the camps returned to their schools with a CSI kit, which included materials necessary to replicate the activities from camp in their classrooms. These kits exponentially expand the number of students impacted by the program.

These camps are a unique, engaging way of exposing middle-school students to real-world uses for math and science. By interacting with real-life experts, the students not only learn about how CSI is done in real life, but they are introduced to potential role models and potential career fields that may encourage them to learn more.

STUDENT SPOTLIGHT:

SCIENCE ENGINEERING APPRENTICESHIP PROGRAM (SEAP)

Jahnavi Curlin

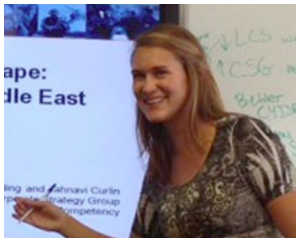
I am a person of many interests, sharing a love of language and science, math and forensics. During my time as a SEAP Intern at Space and Naval Warfare Systems Command (SPAWAR), I have leveraged and cultivated all my passions and talents, from public speaking to science and technology. In terms of my personal accomplishments, throughout my internship I enhanced the leadership's situational awareness by writing original pieces on pressing current events and posting them on our internal blog. The strategic planning meetings and routine CSG staff meetings I took part in were an integral part of my internship and provided me with good insight into how a naval research lab operates. I was also able to attend an all-hands meeting called by Rear Adm. Patrick Brady, commander of the SPAWAR.

I assisted on several projects that were directly requested by SSC Pacific Executive Director Carmela Keeney, but my most notable project was a brief to senior leadership about the current strategic landscape in the Middle East and the implications for SSC Pacific. The creation of the brief was a multi-step process that concluded in providing our senior leadership with a comprehensive analysis of the region. My time with the CSG was exceptional. As a high school intern, I was privy to the kind of work that most of my peers have not yet had the chance to experience. The blogging, projects, dissemination of information, meetings and writing pushed me to excel, and the work relationships and friendships throughout the department and center fostered a positive working environment that contributed to my success there. As I enter my senior year of high school and begin to plan my future, I am satisfied knowing I was part of an experience like SEAP—a program designed to improve the youth and the future of our nation.

The Science Engineering and Apprenticeship Program is designed to provide high school Junior and Senior students with hands-on real-world internships along side Naval scientists and engineers in a laboratory setting. The SEAP program is managed by the Office of Naval Research with the support of ASEE.

NAVAL RESEARCH ENTERPRISE INTERN PROGRAM (NREIP)

Narciss Spaulding



As a graduate student focusing on international economics, I was excited when I learned about the internship opportunities with the Corporate Strategy Group (CSG) at Space and Naval Warfare Systems Command (SPAWAR). In my short time as an NREIP intern, I learned a great deal about how the CSG and SSC Pacific conduct business and what exactly the Navy does; I gained knowledge on current events and the congressional budget, and I learned how to present myself professionally.

As the weeks have gone by, I have come to understand that the CSG's primary role is to gain as much knowledge as possible about the environment the Navy faces, and to be able to relay the information to senior leadership so they can make informed, strategic decisions. I have written countless blog posts and four white papers; attended meetings, lectures and briefs; created reference materials for future interns; responded to requests for information from our executive director; and read numerous documents for background information. Additionally, I built a comprehensive list of chief information officers within DoD that will be used by the center's senior leadership. My greatest accomplishment was generating and presenting a briefing to leadership and other groups at SSC Pacific on current issues in the Asia- Pacific region, explaining why emerging events in Asia are of importance to the SSC Pacific. My time at SSC Pacific has been a wonderful experience that will be extremely useful for my future career path and professional development. The main reason the internship was so great was that I was able to interact with other NREIP interns and see their projects. I was amazed by the talent and skill these individuals brought to SSC Pacific and am pleased to know the future of the DoN lies in such knowledgeable hands.

The Naval Research Enterprise Intern Program (NREIP) is designed to provide under and graduate students with hands-on real-world internships along side Naval scientists and engineers in a laboratory setting. The NREIP program is managed by the Office of Naval Research with the support of ASEE.

CZECH-US SUSTAINABLE ENERGY CONFERENCE

Naval STEM efforts were highlighted at "The Czech-US Sustainable Energy Conference and Innovation: Charting the Course for Sustainable Energy" hosted by Czech Technical University on September 20th and 21st in Prague. Speakers from the US and Czech Republic noted the importance of investing in STEM education for the development of a qualified, national STEM Workforce. Dr. Michael Kassner, former Director of Research at the Office of Naval Research, discussed the importance of developing and attracting scientists and engineers into energy. Dr. Joe Calantoni, from NRL-Stennis, discussed leveraging STEM programs to develop students in research areas of high relevance to the Navy. Steve Barkanic, from the Business Higher Education Forum, shared best practices on creating and maintaining partnerships between government, industry and academia to more successfully cultivate a strong STEM workforce.

Three Naval STEM programs -- Iridescent Technovation, SeaPerch, and USNA STEM -- each showcased their hands-on programs at the conference. Iridescent Technovation will be expanding its program internationally this year and has plans to establish a regional site in the Czech Republic. Technovation helps high school girls develop smart phone applications (apps) and supporting business pitches. SeaPerch, which showcased its middle school underwater robotics program at the conference, teaches students about engineering and science. The Naval Academy demonstrated some of the hands-on sustainable energy activities that they include in their STEM kits leaving behind samples for Czech teachers.

ONR SCIENCE AND TECHNOLOGY CONFERENCE

On October 24-24, the Navy showcased some of its premiere STEM (Science, Technology, Engineering, and Mathematics) education programs during ONR's Science and Technology (S&T) Partnership Conference. On display were national programs such as SeaPerch, DoD STARBASE, and FIRST Robotics. In addition, the US Naval Academy highlighted some of their hands-on activities, which are used during their STEM camps. Iridescent, an ONR funded program, shared their Navy relevant hands-on activities including a water bottle submarine and several collaborative experiments based on the research of Naval Scientists. Another ONR funded effort, Gooru, demonstrated its free online tool for finding and creating high quality, personalized teaching and learning materials. NAVSEA entertained attendees with a FIRST robotics demonstration, where the basketball-playing robot created by FIRST Team 1915 from McKinley Technology High School (Washington, DC) stole the show. The Conference provided a terrific venue to share the Naval STEM programs with S&T professionals who are the parents, potential mentors, and future employers of the students reached by these programs. For additional information about these programs, visit their websites listed on the last page of this newsletter.

Rear Admiral Klunder achieves neutral buoyancy with a water bottle submarine from Iridescent, just one of many hands-on, engineering activities demonstrated at the Naval S&T STEM Exhibit Hall space.

NAVAL STEM STRATEGY AND PRIORITIES

The Naval STEM Strategic Roadmap focuses on five priority areas:

• ***Inspire*** the next generation of scientists and engineers.

• ***Engage*** students and build their STEM confidence and skills through hands-on learning activities that incorporate Naval-relevant content.

• ***Educate*** students to be well prepared for employment in STEM careers that support the Navy and Marine Corps.

• ***Employ***, retain and develop Naval STEM professionals.

• ***Collaborate*** on STEM efforts across the Department of the Navy, the Federal government and best practice organizations.

Ensuring American security and competitiveness, and Naval STEM workforce excellence, requires a broad agenda focusing on attracting and developing a world class teaching corps, encouraging and inspiring today's students to prepare for and pursue STEM pathways, embracing diversity, and reducing current attrition rates at all stages of the pipeline. The Navy is collaborating with business, non-profit leaders, academic and research communities to leverage resources to advance STEM education, and promote the sharing of best practices and successful models. Partnerships with formal and informal education institutions and engagement and support of teachers and students will help bridge the gaps and address the needs of the Navy and the nation.

Read the complete plan: Download the 2011 Navy STEM roadmap at: http://bit.ly/Wx9fnZ

SciGirls TAKES SEAPERCH TO THE NATIONAL SCREEN

On October 19, on PBS stations nationwide, the award-winning PBS show SciGirls, aired its first episode of the season -- Aquabots. This episode featured the Navy's signature STEM program, SeaPerch, profiling an all girls student team as they built an underwater remote-controlled robot. SeaPerch is part of the Navy's larger STEM effort to encourage students to pursue STEM careers and is geared specifically towards getting middle school students interested in math and science. A link to the video can be found at http://pbskids.org/scigirls/video.

In the Aquabots episode, 12- and 13-year old girls try to investigate the health of oysters in the Chesapeake Bay. Their ultimate goal: to compare a new oyster reef to an older one and determine the health of the bay. The students first head to the U.S. Naval Academy, where they are introduced to a SeaPerch robotics kit. The girls brainstorm goals for the robot, and then proceed to design, build and test a SeaPerch robot. They also take their creation to the Naval Surface Warfare Center Carderock Division to test the robot's abilities in currents. Ultimately their SeaPerch robot helps them in their assessment of the Bay.

Through their grant with ONR, Twin Cities Public Television also developed an online game to accompany the show that can be found at: http://pbskids.org/scigirls/aquabot.

FAST FACTS

- *Jobs requiring math are increasing **4x faster** than overall job growth*
- *According to a study in the journal Child Development, girls' and boys' attitudes about math begin to diverge as early as **second grade***
- *Only **18%** of High school Seniors are rated as Science Proficient and **33%** as Math Proficient*
- *Engineering only makes up **4.4%** of undergraduate degrees in the US, this is among the lowest globally, with the global average at 13%*
- *The United States ranks **26th** relative to other countries in the share of college students who get undergraduate degrees in science or engineering*
- ***One in four** scientists and engineers working in the United States was born outside the United States*
- ***30 %** of Americans say they would rather clean the bathroom than solve a math problem.*

ABOUT STEM2STERN

STEM2Stern is the Department of the Navy's centralized STEM Initiative. Under the leadership of the Chief of Naval Research, who serves as the Naval STEM Executive, STEM2Stern works with the SYSCOMS, Naval Laboratories, Warfare Centers, and other research and education institutions to better leverage resources and maximize the impact of the Departments STEM investments.

These investments support a wide variety of STEM educational programs, ranging from activities designed to spark younger students' interest in STEM careers, to more in-depth, hands-on learning opportunities for middle and high school students, internships and research fellowships for older high school and post-secondary students, professional development opportunities for Naval STEM professionals and faculty.

STEM2Stern.org provides information about Science, Technology, Engineering and Mathematics (STEM) programs sponsored by the U.S. Navy. This includes recent news about the programs, as well as specific program descriptions and success stories.

The website allows users to search for programs by location participant, grade, program type or by typing in the name of the program. The information provided to the general public includes a brief program description, location, activity duration, and a public email contact. We encourage you to visit STEM2Stern.org to learn more!

STEM BIOS

Commander Joseph Cohn, PhD. is an Aerospace Experimental Psychologist (AEP) in the U.S. Navy's Medical Service Corps. He is currently the Office of Naval Research's Deputy Director of Research, for Science, Technology, Engineering and Mathematics. CDR Cohn's past efforts focused on developing and transitioning advanced performance enhancing technologies, with an emphasis on adaptive training and education capabilities.

Carolyn Van Damme serves as the Director for the Naval STEM Coordination Office, located at the Office of Naval Research. She has a long history of developing and working with STEM education programs, most notably FIRST Robotics. She is a STEM professional with over 20 years experience working within the high tech industry, research universities and education not-for-profits.

To contact our office directly send emails to info@stem2stern.org

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Office of Naval Research
ONR
Science & Technology

DEPARTMENT OF THE NAVY
UNITED STATES OF AMERICA

UPCOMING STEM EVENTS

SEAP Applications due January 7, 2013 at 5:30pm EST
seap.asee.org

NREIP Applications due January 7, 2013 at 5:30pm EST
nreip.asee.org

51st National JSHS
May 1-5, 2013
Dayton, Ohio
Registration opens January 2013
www.jshs.org

FIRST Championship
April 24-27, 2013
St. Louis, Missouri
www.usfirst.org

2013 Raytheon MATHCOUNTS National Competition
May 10, 2013
Washington, DC
mathcounts.org

SeaPerch National Challenge
May 18, 2013
Indianapolis, Indiana
www.seaperch.org

NAVAL STEM WEBSITES AND SPONSORED ACTIVITIES

Below is a list of websites that may be of interest to this community. It includes web addresses for various Naval programs, as well as some of our signature program partners.

www.STEM2Stern.org
www.usna.edu/STEM
www.seaperch.org
www.iridescentlearning.org
www.gooru.org
www.ndep.us
www.asee.org/SEAP
www.asee.org/NREIP
www.asee.org/SMART
www.nmsi.org
www.dodstarbase.org
www.usfirst.org

WWW.STEM2STERN.ORG